

Final Report

Arizona Grain Research and Promotion Council

September, 2005

Testing Low Input Barley and Wheat Lines

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TITLE: Testing low input barley and wheat lines

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DURATION: November, 2005 to November, 2005

SUMMARY: Head rows of 4 experimental lines each of barley and wheat were grown at the Maricopa Agricultural Center. One barley and one wheat line were harvested and the seed retained as breeders seed. The barley line is significantly improved in yield, test weight, and lodging resistance compared to Solum. The wheat line does not represent a significant improvement over Yecora rojo, and may not be released.

BACKGROUND: The low input barley line, Solum, was released in 1992 by Dr. Tom Ramage. Solum has been a successful variety for reduced water use conditions, but lodging and low test weight can be problems with this variety. Dr. Ramage continued his breeding work with low input barley after Solum was released, and also worked with low input wheat. Dr. Ramage retired in 1999 and left me with over 200 barley and wheat lines adapted to water stress conditions from which successors to Solum may be selected. The Arizona Grain Research and Promotion Council supported the initial screening of these lines in 2001 and 3 years of testing of 20 lines at one, two, and seven irrigations from 2002-2004.

OBJECTIVES: Purify four lines each of barley and wheat that have less lodging and higher test weight than Solum, and equal or better grain yield.

DESCRIPTION OF THE WORK: The previous growing season, about 100 heads were picked from four promising lines each of barley and wheat. These heads were individually threshed with the intention of planting in head rows the next season. These head rows were seeded on December 1, 2004 at the Maricopa Agricultural Center. A total of 92 head rows of four lines each of barley (entries 2, 9, 15, and 17) and wheat (entries 1, 11, 12, and Xeric) that were selected from the previous 3 years of testing were seeded. The head rows were planted in groups of four rows per plot, and each plot was 5 ft wide and 20 ft long. Barley and wheat were alternated in 5 ft strips to prevent cross pollination. The crop was irrigated on December 1, January 28, and March 18. Ammonium phosphate (16-20-0) was applied before planting providing 100 lbs P₂O₅/acre and 80 lbs N/acre. Urea (46-0-0) was broadcast at 50 lbs N/acre before irrigation on January 28.

RESULTS: Barley entry 2 and wheat entry 12 were rouged on May 24, 2005 at the harvest ripe stage by removing individual heads, plants, or entire rows that were off-types. Barley entry 2 was relatively pure and did not require much rouging. About half the head rows of wheat entry 12 were rouged either because they were off-types or contained excessive yellow berry. Barley entry 2, wheat entry 12, and a composite of the other three barley entries (all 2-row types) were harvested with a small plot combine on May 24, 2005. Grain from these head rows will be considered breeders seed.

Based on results of testing from the previous 3 years, barley entry 2 is clearly superior to the other entries and is improved compared to Solum (Table 1). Compared with Solum, grain yield was higher by 500 lb/acre, test weight was higher by 4 lbs/bu, and lodging was decreased by half for barley entry 2. The plant height was similar but was a week later in maturity. The other barley entries that were planted in head rows were 2-row types and late in maturity. A composite of these entries was harvested for their potential for forage.

The highest yielding wheat entries from the previous 3 years were entry 11 and Xeric. However, both of these contained too much variation in head type to be able to enter the seed certification program. Therefore, entry 12 was chosen because it was the next highest yielder, but also because its seed is the hardest of all the entries. The problem with the wheat entries is that none of them show much improvement compared with Yecora rojo. Entry 12, the best wheat that we can obtain pure seed of, averaged only 100 lbs/acre greater yield than Yecora rojo. So, I do not think it is worth pursuing the release of a wheat variety for low input conditions.

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Table 1. Grain yield and other characteristics of low input barley entry 2 compared with Solum averaged over 3 years of testing at the Maricopa Agricultural Center.

Irrigations	Entry	Grain yield lbs/A	Test weight lbs/bu	Plant height inches	Lodging %	Heading	Anthesis	Maturity
1	2	2598	52.0	33	2	2-Mar	4-Mar	13-Apr
1	Solum	2406	46.6	31	23	1-Mar	3-Mar	7-Apr
2	2	3595	51.8	37	28	3-Mar	5-Mar	15-Apr
2	Solum	3146	46.7	34	55	28-Feb	4-Mar	7-Apr
7	2	5262	51.5	39	43	1-Mar	4-Mar	28-Apr
7	Solum	4443	48.8	39	70	1-Mar	3-Mar	16-Apr
	2	3818	51.8	36	24	2-Mar	4-Mar	18-Apr
	Solum	3332	47.4	35	49	1-Mar	3-Mar	10-Apr
	Difference	487	4.4	1.6	-25.2	1.4	1.0	8.7

Table 2. Grain yield and other characteristics of low input wheat entry 12 compared with Yecora rojo averaged over 3 years of testing at the Maricopa Agricultural Center.

Irrigations	Entry	Grain yield lbs/A	Test weight lbs/bu	Plant height inches	Lodging %	Heading	Anthesis	Maturity
1	12	2198	58.3	30	0	4-Mar	9-Mar	14-Apr
1	Y. rojo	1861	59.5	25	0	10-Mar	17-Mar	17-Apr
2	12	2807	57.5	34	8	5-Mar	11-Mar	13-Apr
2	Y. rojo	2845	58.8	30	0	12-Mar	18-Mar	18-Apr
7	12	5677	62.7	36	28	7-Mar	13-Mar	27-Apr
7	Y. rojo	5669	63.4	32	6	15-Mar	20-Mar	30-Apr
	12	3561	59.5	33	12	5-Mar	11-Mar	18-Apr
	Y. rojo	3458	60.6	29	2	12-Mar	18-Mar	22-Apr
	Difference	102	-1.1	4.3	9.9	-7.1	-7.4	-3.6